



BIM-ovation

Park Avenue Child Care Center Design Development

Architect: Hamed Aali
 Landscape Architect: Nick Landiak
 Construction Engineer: Neal Diehl
 Structural Engineer: Stephen Pfund
 Mechanical Engineer: Alexander Stough
 Lighting Engineer: Josh Winemiller

BIM Studio
 ARCH 497C



Architecture

Landscape
Architecture

Structural
Engineering

Mechanical
Engineering

Lighting-
Electrical
Engineering

Construction
Engineering

Designing for a Child



Architecture

Landscape
Architecture

Structural
Engineering

Mechanical
Engineering

Lighting-
Electrical
Engineering

Construction
Engineering



The Relationship of Nature and Learning



Design Process

Architecture

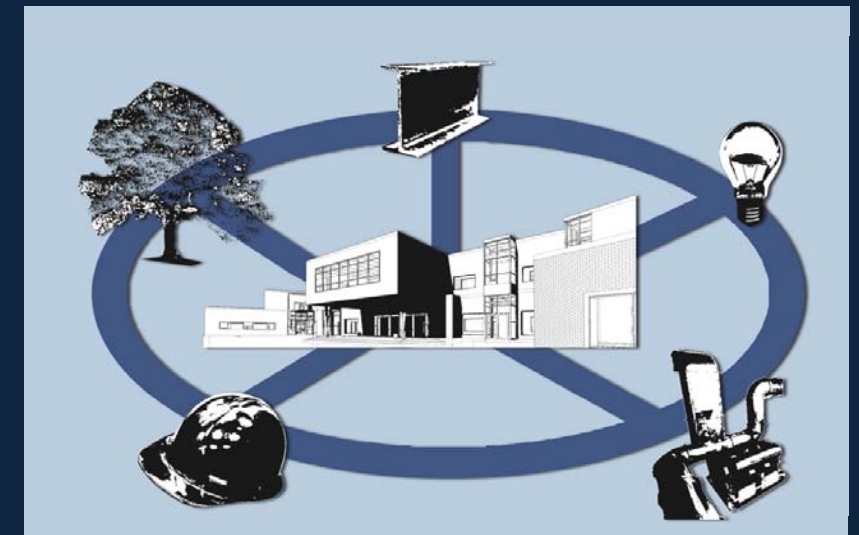
Landscape
Architecture

Structural
Engineering

Mechanical
Engineering

Lighting-
Electrical
Engineering

Construction
Engineering



First Floor

- Architecture
- Landscape Architecture
- Structural Engineering
- Mechanical Engineering
- Lighting-Electrical Engineering
- Construction Engineering



- | | | |
|-------------------|-------------------------------|-------------------------------|
| 1. Entrance | 9. Teachers' Room | 17. Messy Art |
| 2. Waiting Area | 10. Meeting Area | 18. "Nature Eye" |
| 3. Reception | 11. Storage | 19. "Nature Bridge" |
| 4. Staircase | 12. Hallway | 20. "Dreams Garden" |
| 5. Elevator | 13. Infant/ Toddler Classroom | 21. Library |
| 6. Kitchen | 14. Storage | 22. Covered "Gathering" Space |
| 7. Assistant Dir. | 15. Restroom | 23. "Story Garden" |
| 8. Director | 16. Food Preparing | |



Second Floor

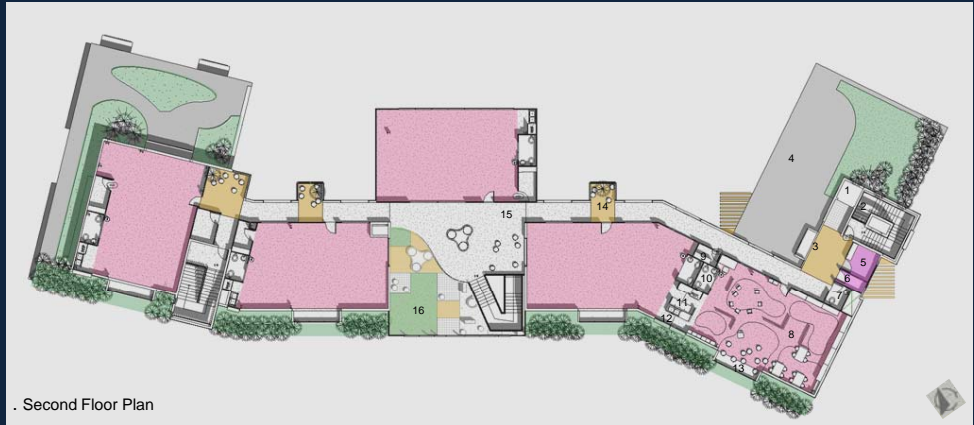
- Architecture
- Landscape Architecture
- Structural Engineering
- Mechanical Engineering
- Lighting-Electrical Engineering
- Construction Engineering



. Bird's Eye View to South Side



. Longitudinal Section



. Second Floor Plan

- | | |
|--------------------|----------------------|
| 1. Elevation | 10. Restroom |
| 2. Staircase | 11. Food Preparation |
| 3. "Nature Bridge" | 12. Messy Art |
| 4. Roof Garden | 13. "Nature Eye" |
| 5. Teachers' Room | 14. "Story Garden" |
| 6. Laundry | 15. Hallway |
| 7. Restroom | 16. "Dreams Garden" |
| 8. Pre-School Room | |
| 9. Storage | |



. View to Entrance



. East Elevation

Architecture

Landscape
Architecture

Structural
Engineering

Mechanical
Engineering

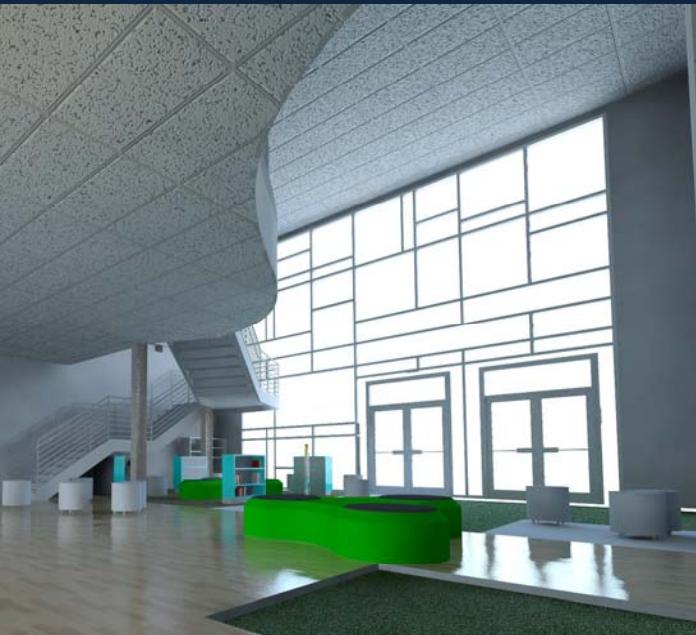
Lighting-
Electrical
Engineering

Construction
Engineering

Area Justifications



Child Care Center Area Justification					
Functional Areas Programmed			As Designed		
Director	125	Director	130	SF	
Assistant D	100	Assistant D.	100	SF	
Business Office	135	Business Office	100	SF	
kitchen	505	Kitchen	543	SF	
Lobby, Recep	300	Lobby, Rec.	500	SF	
Library	250	Library	Atrium Included	SF	
Meeting Space	390	Meeting	172	SF	
Adult Toilet	240	Adult Toilet	100	SF	
Lounge, Break	210	Lounge Br	130	SF "Story Garden"	
Laundry	115	Laundry	50	SF	
GM Area	550	GM Area	Included	SF "Dreams Garden"	
Telecom	100	Telecom	100	SF	
MEP	900	MEP	2000	SF	
Infant/Toddler	1472	Infant/Toddler	1323	SF	
Infant/Toddler	1472	Infant/Toddler	1420	SF	
Infant/Toddler	1472	Infant/Toddler	1435	SF	
Infant/Toddler	1472	Infant/Toddler	1390	SF	
Infant/Toddler	1472	Infant/Toddler	1400	SF	
Pre_school	1100	Pre_school	1132	SF	
Pre_school	1100	Pre_school	1072	SF	
Pre_school	1100	Pre_school	1117	SF	
Pre_school	1100	Pre_school	1154	SF	
Pre_school	1100	Pre_school	1100	SF	
		Atrium	1000	SF "Dreams Garden"	
		Storage 3	60	SF	
		Teachers	200	SF	
		Storage 1	45	SF	
		Storage 2	60	SF	
Total	16420	Total Enclosed W/O Circ	17703	GS	165
		Covered Space	500 + Atrium included		



Architecture
Landscape
Architecture

Structural
Engineering

Mechanical
Engineering

Lighting-
Electrical
Engineering

Construction
Engineering

Project Team Key Schedule Dates			
ACTIVITY	START	FINISH	
Notice to Proceed	2/12/2010		
Start Site Clearing	2/16/2010	3/1/2010	
Pour First Footings	3/29/2010	4/2/2010	
Complete Ext. Bldg. Construction	6/23/2010	9/28/2010	
Complete Ext. Site Construction	9/15/2010	11/9/2010	
Project Substantial Completion		12/7/2010	
Project Close Out	12/7/2010	12/25/2010	


Cost Estimation
\$ 7,614,100

Key Schedule Dates
Total Project Duration
10 ½ Months

Cost Item		
SITE PREP		
		\$120,000.00
Site Demolition	\$56,000.00	
Earthwork	\$43,000.00	
Utility Tie-Ins	\$21,000.00	
HARDSCAPE/LANDSCAPE		
		\$595,000.00
Exterior Play Areas	\$350,000.00	
Site Enclosure/Signage	\$133,000.00	
Site Furnishings	\$101,000.00	
Paving/Parking	\$11,000.00	
CORE, SHELL & FINISHES		
		\$4,053,600.00
Structure (incl. foundations)	\$1,040,600.00	
Enclosure	\$1,410,000.00	
Doors & Windows	\$1,134,000.00	
Interior Partitions & Finishes	\$275,000.00	
Finished Carpentry	\$102,000.00	
Moisture/Waterproofing	\$20,000.00	
Painting	\$30,000.00	
Miscellaneous Metals	\$12,000.00	
Signage	\$10,000.00	
Accessories	\$20,000.00	
ELEVATOR		
	\$82,500.00	\$82,500.00
SYSTEMS		
		\$2,071,000.00
Fire Suppression	\$95,000.00	
HVAC/Plumbing	\$1,438,000.00	
Electrical (alarm, comm, data)	\$538,000.00	
General Conditions		
		\$692,000.00
Supervision	\$212,000.00	
Bonds	\$145,000.00	
Site Operations	\$335,000.00	
TOTAL CONSTRUCTION COST		\$7,614,100.00

Architecture
Landscape
Architecture
Structural
Engineering
Mechanical
Engineering
Lighting-
Electrical
Engineering
Construction
Engineering

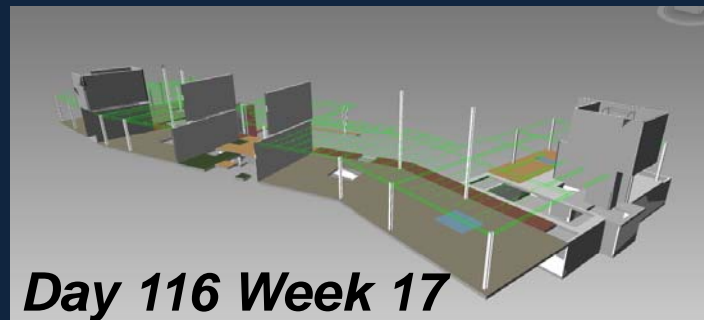
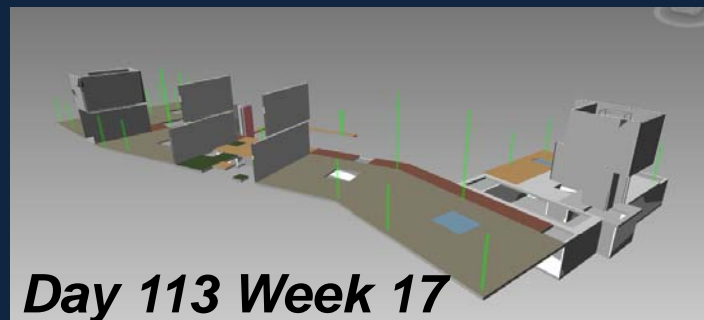


			LEED 2009 for New Construction and Major Renovation	
			Project Checklist	
			Project Name : Gary Schultz Child Care Center	
			Date : April 27 2010	
82	0	0	Total	
			Possible Points: 110	
Certified 40 to 49 points			Silver 50 to 59 points	
Gold 60 to 79 points			Platinum 80 to 110	

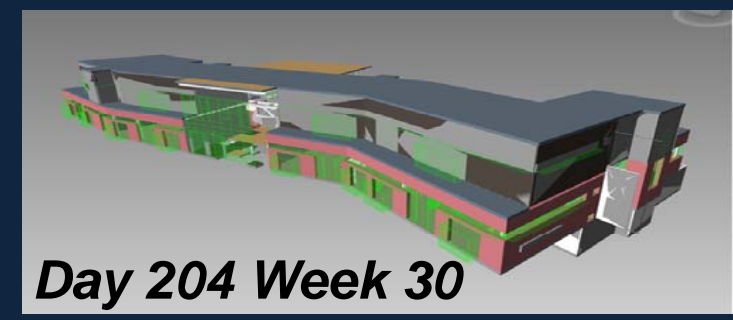
LEED Platinum
82 Out of 110
Possible Points



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Construction
Engineering

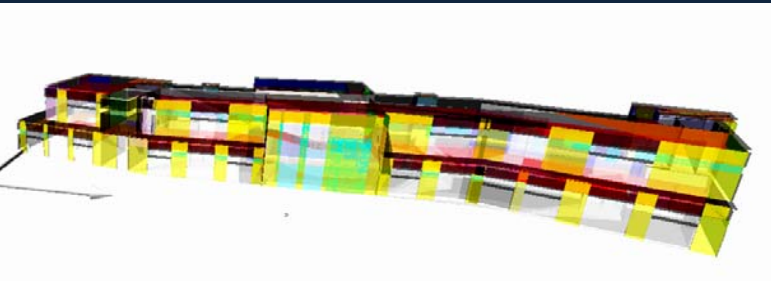


4-D Modeling



Energy Analysis

- Architecture
- Landscape Architecture
- Structural Engineering
- Mechanical Engineering
- Lighting-Electrical Engineering
- Construction Engineering

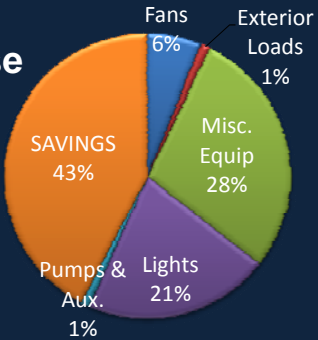


GBXML File

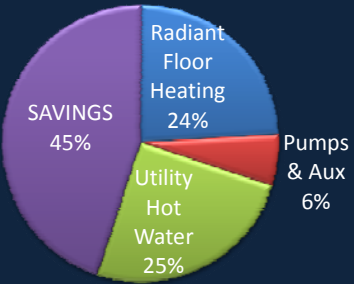
	Baseline	Proposed	Conservation	Cost Savings
Electricity (KW)	259,847	149,707	110,140	\$11,000
Fuel (Therms)	13,268	7,312	5,956	\$8,400
Renewable		345		
Operating Costs	\$44,700	\$25,300		\$19,400
Energy Intensity (kBtu*ft^2/yr)	100.4	56.3		

43.6% Energy Savings from Baseline

Annual Electricity Use



Annual Fuel Use



First Floor- Reception

Architecture

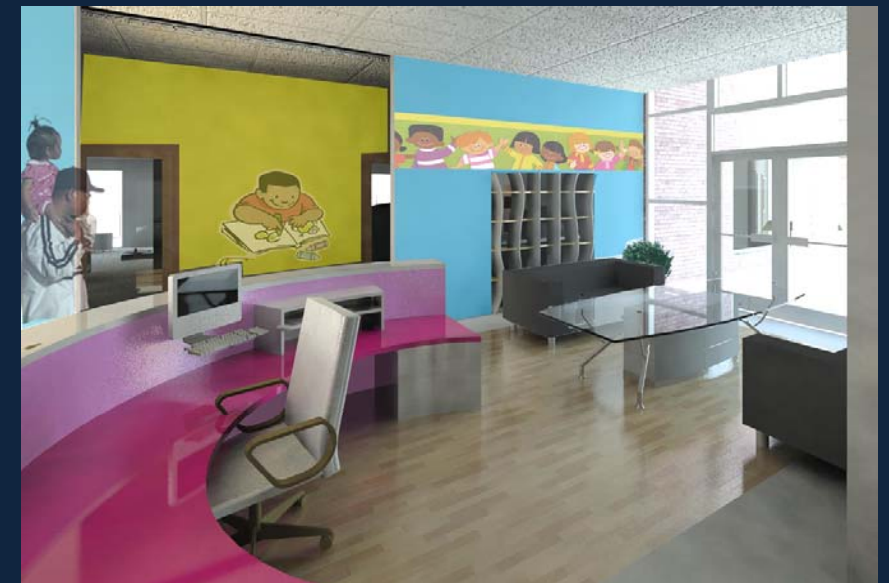
Landscape
Architecture

Structural
Engineering

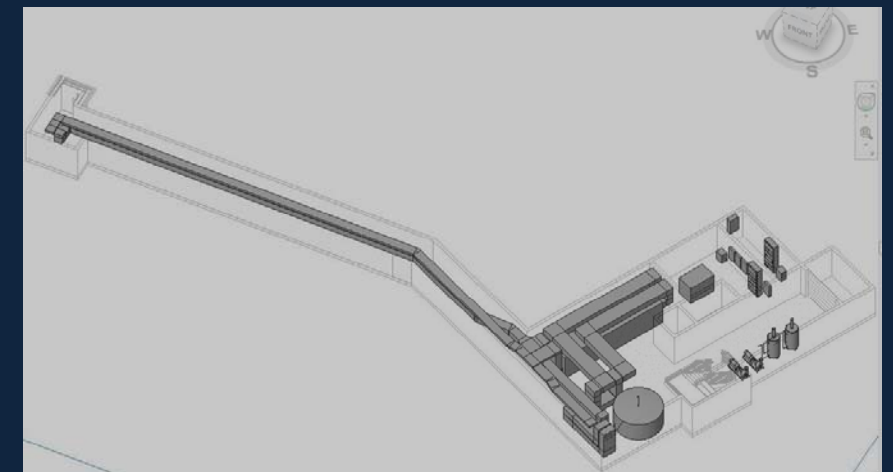
Mechanical
Engineering

Lighting-
Electrical
Engineering

Construction
Engineering



First Floor- Reception



Basement Perspective

Architecture
Landscape
Architecture
Structural
Engineering
Mechanical
Engineering
Lighting-
Electrical
Engineering
Construction
Engineering

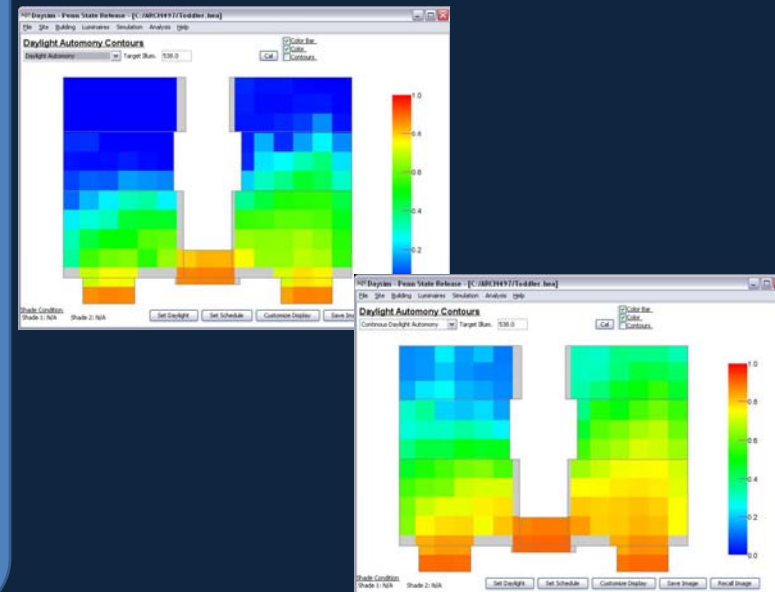
First Floor- Infant area






- Architecture
- Landscape Architecture
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- Mechanical Engineering
- Lighting-Electrical Engineering
- Construction Engineering

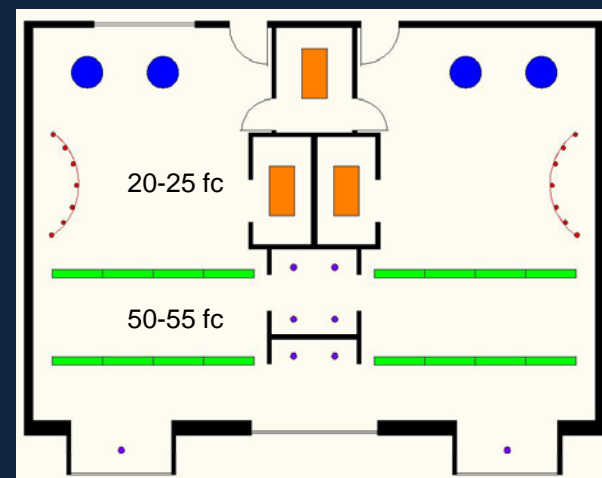


Classroom Lighting

Architecture
Landscape Architecture
Structural Engineering
Mechanical Engineering
Lighting-Electrical Engineering
Construction Engineering



-  LiteControl Indirect/Direct Linear Fluorescent
-  Visa Lighting Pendant Compact Fluorescent
-  Lightolier Track Metal Halide
-  Lightolier Direct Lensed Linear Fluorescent
-  Lithonia Direct Downlight Compact Fluorescent



Radiant Heating/Cooling

Architecture
Landscape Architecture
Structural Engineering
Mechanical Engineering
Lighting-Electrical Engineering
Construction Engineering



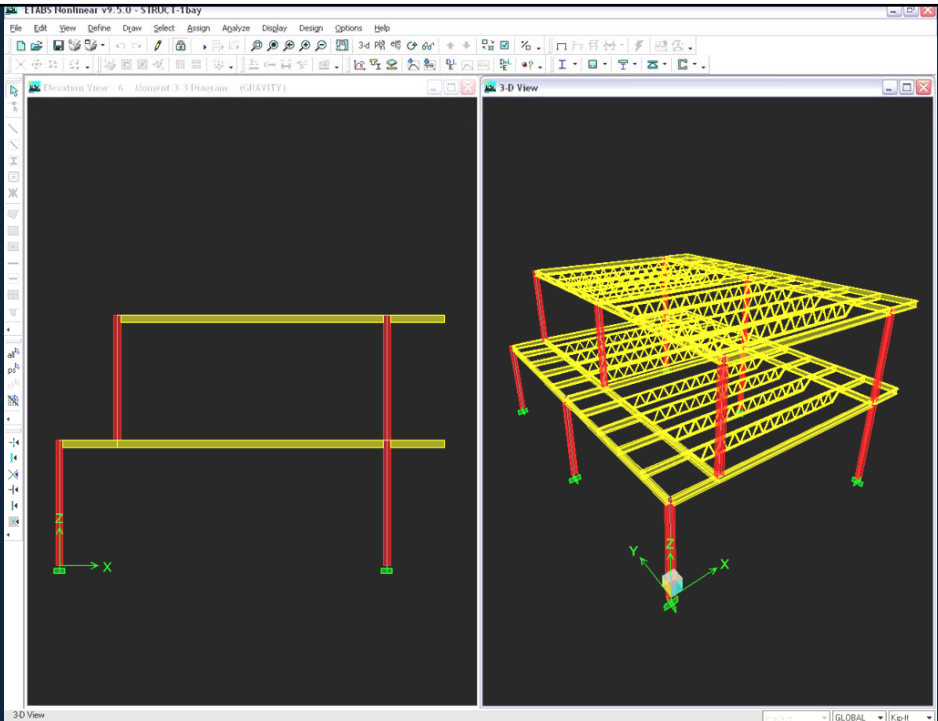
Summer Cooling



Winter Heating

Classroom Structure

- Architecture
- Landscape Architecture
- Structural Engineering
- Mechanical Engineering
- Lighting-Electrical Engineering
- Construction Engineering



First Floor – Atrium

Architecture

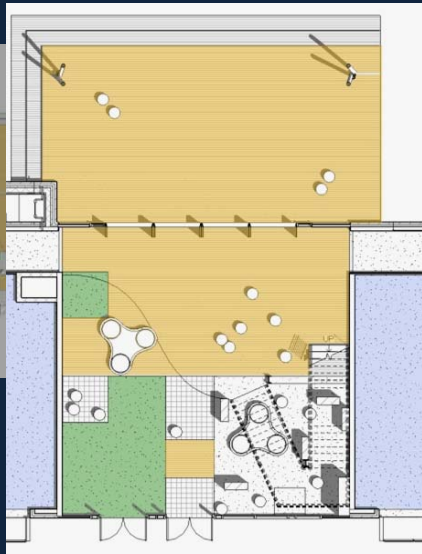
Landscape
Architecture

Structural
Engineering

Mechanical
Engineering

Lighting-
Electrical
Engineering

Construction
Engineering



First Floor – Atrium

Architecture

Landscape
Architecture

Structural
Engineering

Mechanical
Engineering

Lighting-
Electrical
Engineering

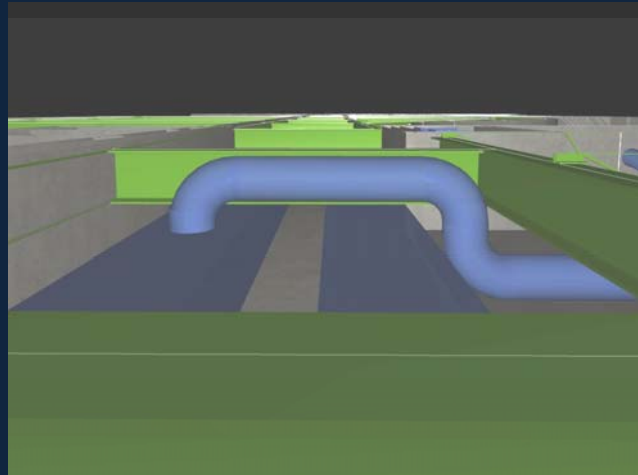
Construction
Engineering



Atrium Section

Atrium Coordination

Architecture
Landscape
Architecture
Structural
Engineering
Mechanical
Engineering
Lighting-
Electrical
Engineering
Construction
Engineering



Second Floor/ Pre-School

Architecture

Landscape
Architecture

Structural
Engineering

Mechanical
Engineering

Lighting-
Electrical
Engineering

Construction
Engineering



Second Floor/ Pre-School

Architecture

Landscape
Architecture

Structural
Engineering

Mechanical
Engineering

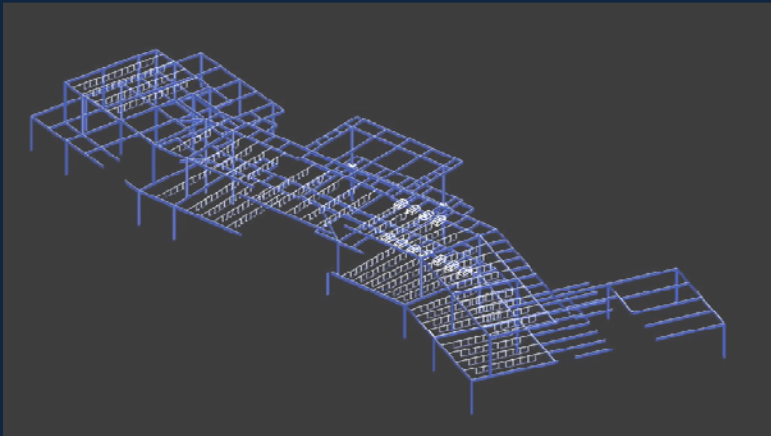
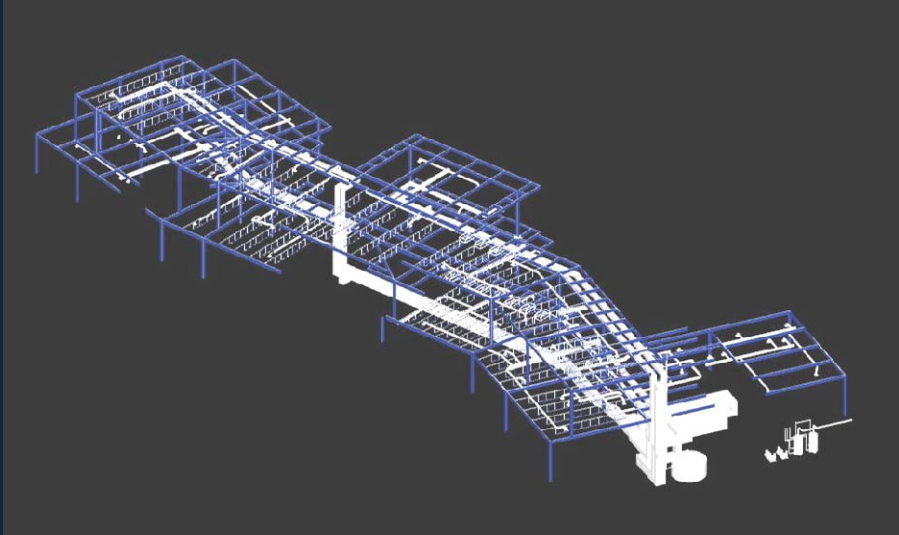
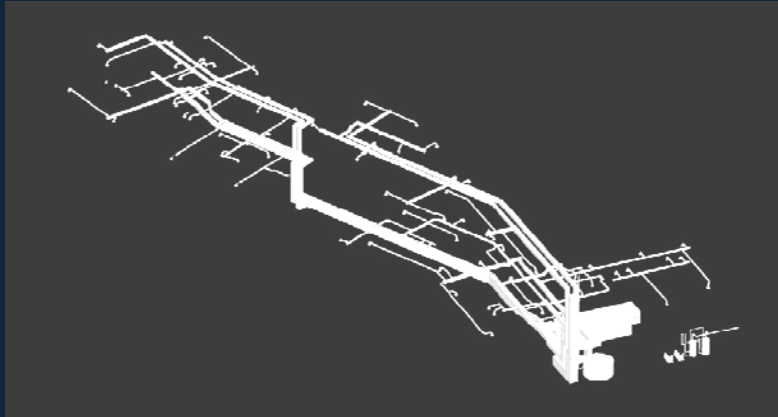
Lighting-
Electrical
Engineering

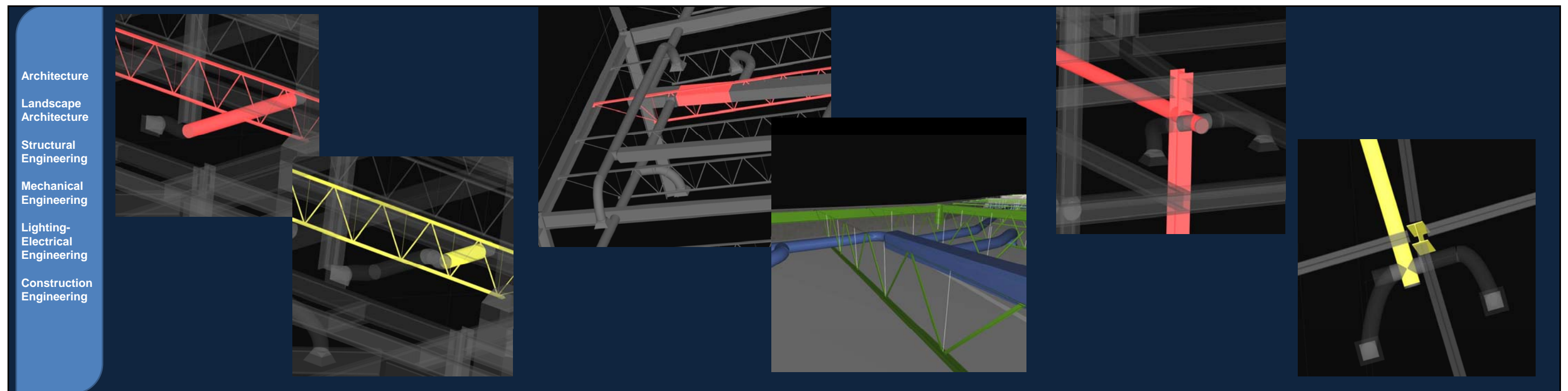
Construction
Engineering



Collision Free Models

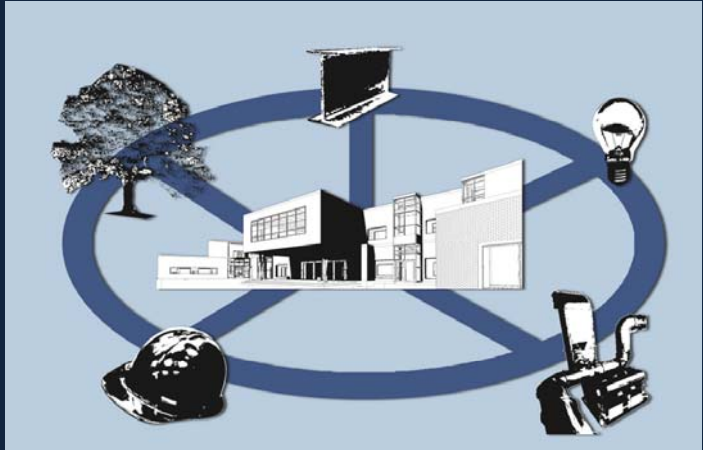
- Architecture
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- Construction Engineering





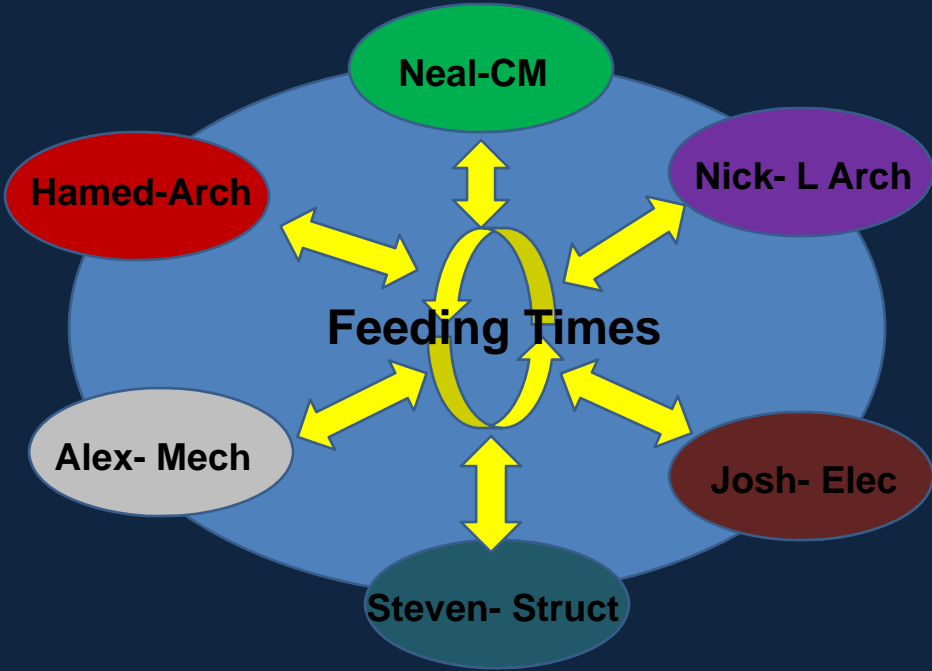
Integrated Project Delivery

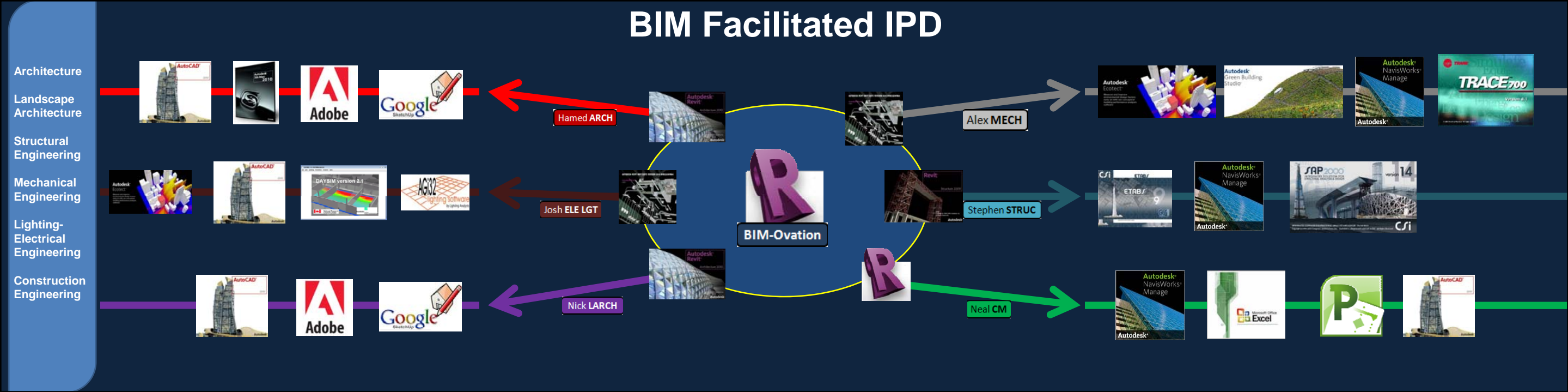
Architecture
Landscape
Architecture
Structural
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Lighting-
Electrical
Engineering
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Engineering



Overall BIM Goals and Uses

- 1. Eliminate Field Conflicts
Increased coordination of building systems
- 2. Value Engineering of Design Decisions
Cost effectively compare building design options
- 3. Effective Site and Systems Analysis
Select the most suitable design
- 4. Energy Efficiency
Model an energy conscious solution





Architecture
Landscape
Architecture
Structural
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Lighting-
Electrical
Engineering
Construction
Engineering



Feeding Time...

Baseline case – Green Building Studio

Estimated Energy & Cost Summary

Annual Energy Cost		\$43,692
Lifecycle* Cost		\$595,090
Annual CO ₂ Emissions		
	Electric [†]	149.4 tons
	Onsite Fuel	77.1 tons
	Large SUV Equivalent	20.6 Large SUV's
Annual Energy		
	Electric	259,596 kWh
	Fuel	13,294 Therms
Annual Peak Electric Demand		118.2 kW
Lifecycle* Energy		
	Electric	7,787,886 kWh
	Fuel	398,820 Therms

Proposed case - TRACE Loads

Cooling Peak Load- 200.4 kBtu/h
Heating Peak Load- 504.4 kBtu/h

----- Monthly Energy Consumption -----													
Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1													
Electric													
On-Pk Cons. (kWh)	2,983	2,686	3,018	2,624	2,651	2,633	2,462	568	2,443	2,686	2,766	2,874	30,394
On-Pk Demand (kW)	15	15	15	15	14	14	14	1	14	15	15	15	15
Gas													
On-Pk Cons. (therms)	660	615	362	93	0	0	0	0	0	13	223	557	2,522
On-Pk Demand (therms/hr)	5	5	5	4	0	0	0	0	0	1	5	5	5

DOAS				
COOLING COIL PEAK				
Peaked at Time:		Mo/Hr: 7 / 14		
Outside Air:		OADB/WBtHR: 91 / 74 / 102		
	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat. Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0.00
Skylite Cond	0	0	0	0.00
Roof Cond	0	18,100	18,100	9.00
Glass Solar	92,200	0	92,200	46.00
Glass/Door Cond	5,850	0	5,850	3.00
Wall Cond	5,637	2,265	7,902	4.00
Partition/Door	0	0	0	0.00
Floor	0	0	0	0.00
Adjacent Floor	0	0	0	0.00
Infiltration	5,374	0	5,374	3.00
Sub Total ==>	109,061	20,374	129,435	65.00
Internal Loads				
Lights	24,382	7,581	31,963	16.00
People	64,103	0	64,103	32.00
Misc	13,211	0	13,211	7.00
Sub Total ==>	101,695	7,581	109,276	55.00
Ceiling Load	3,300	-3,300	0	0.00
Ventilation Load	0	0	-38,150	-19.00
Adj Air Trans Heat	0	0	0	0.00
Dehumid. Ov Sizing	0	0	0	0.00
Ov/Undr Sizing	0	0	0	0.00
Exhaust Heat	0	-204	-204	-0.10
Sup. Fan Heat	0	0	0	0.00
Ret. Fan Heat	0	0	0	0.00
Duct Heat PkUp	0	0	0	0.00
Underflr Sup Ht PkUp	0	0	0	0.00
Supply Air Leakage	0	0	0	0.00
Grand Total ==>	214,056	24,451	200,357	100.00

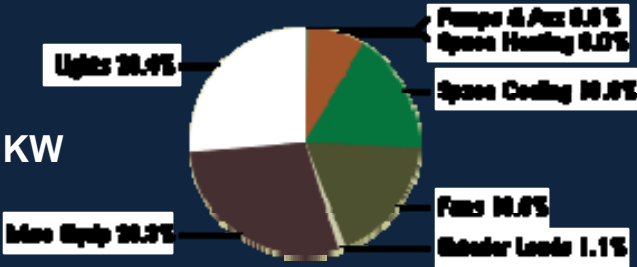
Radiant Heating			
HEATING COIL PEAK			
		Mo/Hr: Heating Design	
		OADB: 11	
	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	-50,354	11.77
Glass Solar	0	0	0.00
Glass/Door Cond	-39,208	-39,208	7.77
Wall Cond	-19,725	-27,473	5.45
Partition/Door	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0.00
Infiltration	-62,295	-62,295	12.35
Sub Total ==>	-121,228	-188,330	37.34
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-30,281	0	0.00
Ventilation Load	-352,903	-352,903	69.98
Adj Air Trans Heat	0	0	0.00
Ov/Undr Sizing	0	0	0.00
Exhaust Heat	0	36,821	-7.30
OA Preheat Diff.	0	0	0.00
RA Preheat Diff.	0	0	0.00
Additional Reheat	0	0	0.00
Underflr Sup Ht PkUp	0	0	0.00
Supply Air Leakage	0	0	0.00
Grand Total ==>	-504,412	-504,412	100.00

Building Energy Use

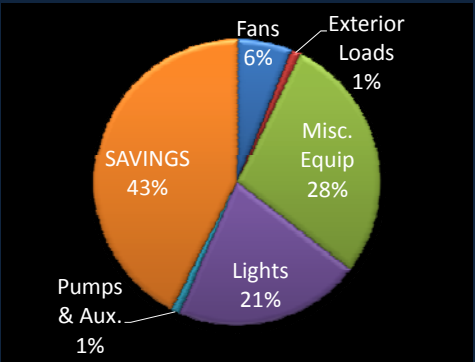
	Baseline Proposed		Conservation Cost Savings	
Electricity (KW)	259,847	149,707	110,140	\$11,000
Fuel (Therms)	13,268	7,312	5,956	\$8,400
Renewable		345		
Operating Costs	\$44,700	\$25,300		\$19,400
Energy Intensity (kBTU*ft^2/yr)	100.4	56.3		

43.6% Energy Savings from Baseline

Baseline-
Energy-259,847 KW
Cost-\$26,000



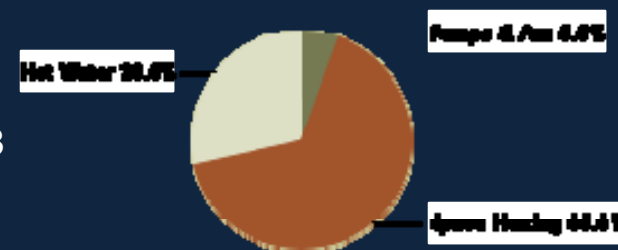
Proposed-
Energy-169,344 KW
Cost-\$17,000



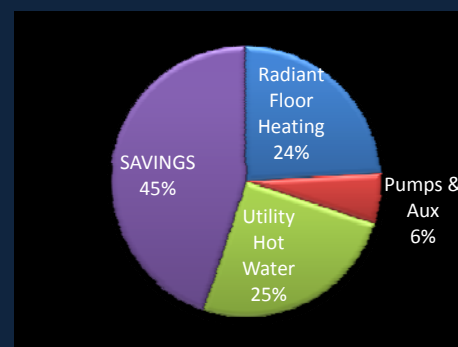
Annual End Electricity Use (KW)

	Baseline Proposal		
Space Heating	20767	0	Satisfied by Radiant Flooring
Space Cooling	43875	0	Satisfied by Chilled Water
Fans	48025	16000	1/3 of Supply CFM
Pumps & Aux.	2336	2570	10% Increase
Lights	68533	54826	20% Decrease
Exterior Loads	2855	2855	Assume No Change
Misc. Equipment	73456	73456	Assume No Change
Total Electricity Use	259847	149707	110140 Yearly Electricity Savings
Total Cost	\$26,000	\$15,000	\$11,000 Yearly Financial Savings

Baseline-
Therms-13,268
Cost-\$18,700



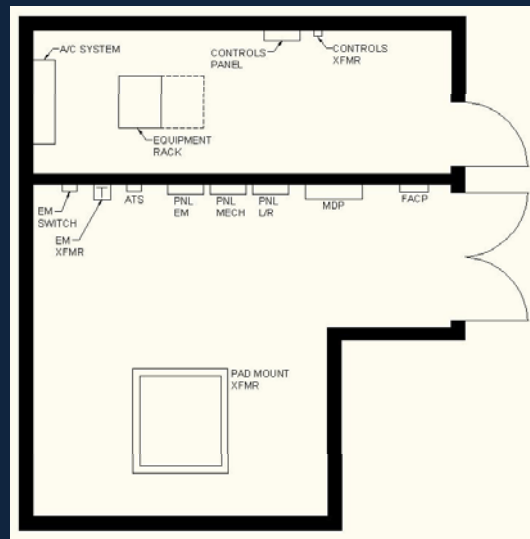
Proposed-
Therms-9,164
Cost-\$13,408



Annual End Fuel Use (Therms)				
	Baseline Proposed			
Hot Water	3780	3320	Aided by Solar Thermal	
Pumps & Aux	730	800	10% Increase	
Heating	8758	3192	Radiant Flooring Efficiency	
Total Fuel Use	13268	7312	5956	Yearly Fuel Savings
Total Cost	\$18,700	\$10,300	\$8,400	Yearly Financial Savings

Elec/Tele Space Requirements

- Electrical Room
 - 256 sf
 - Transformer (70" x 56" x 41")
 - MDP (48" x 32" x 8.25")
 - Clearances
- Telecommunications Room
 - 132 sf
 - Equipment Racks (19" x 36")
- Service Access
 - Basement/ASK ALEX
- Reasons
 - Clearance Issues
 - Easy runs down corridor
 - Plenum space for conduit/cable trays

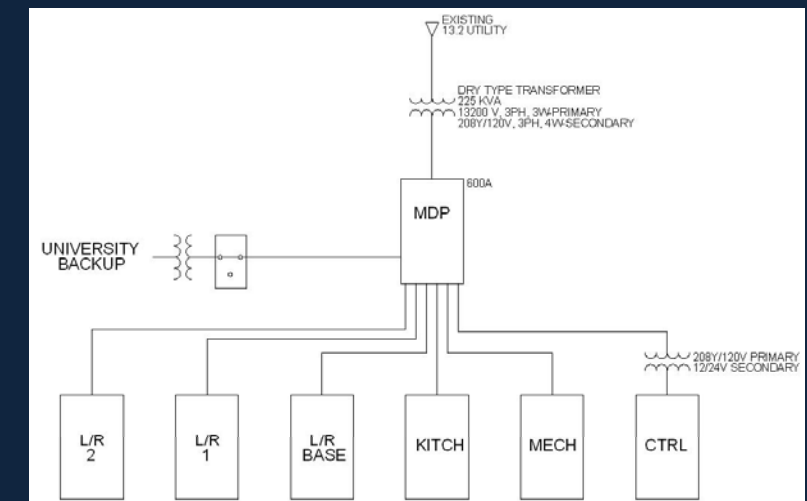


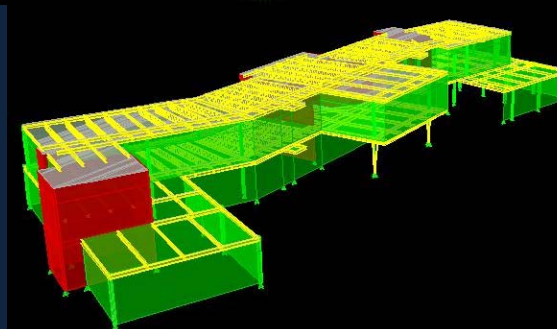
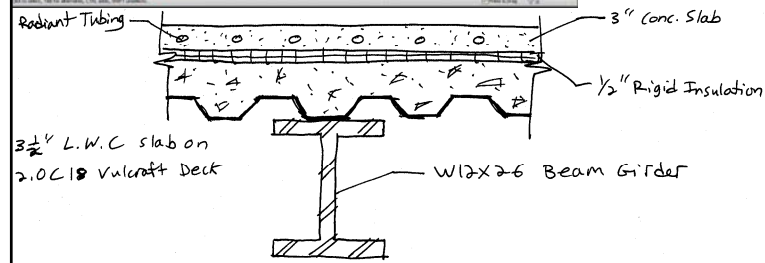
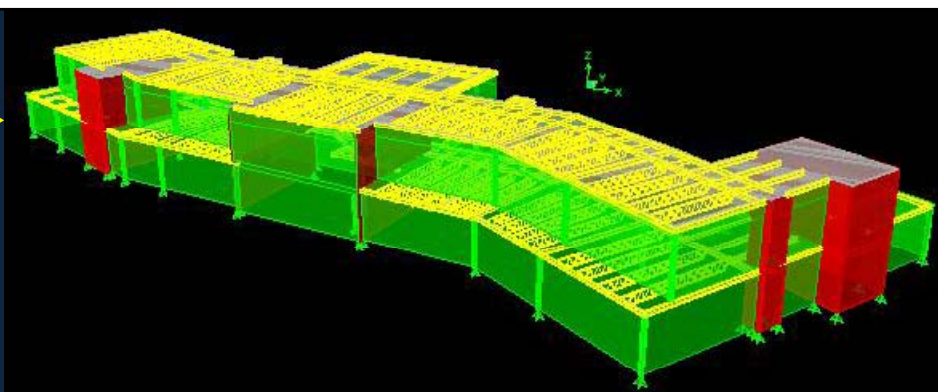
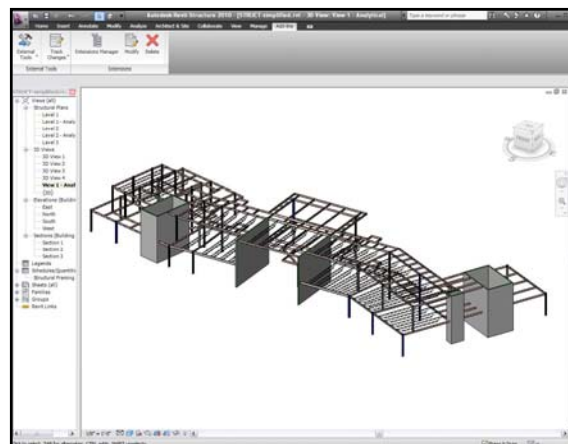
Lighting System Design (Classroom)

- Light Levels
- IESNA – 50 fc (horiz)*
- As Designed – varies
- Dimmable in conjunction with daylighting or naps
- Lighting Power Density
- ASHRAE – 1.4 W/ft²
- As Designed – 1.3 W/ft²

**= no recommended values for day care centers*

Single Line Diagram





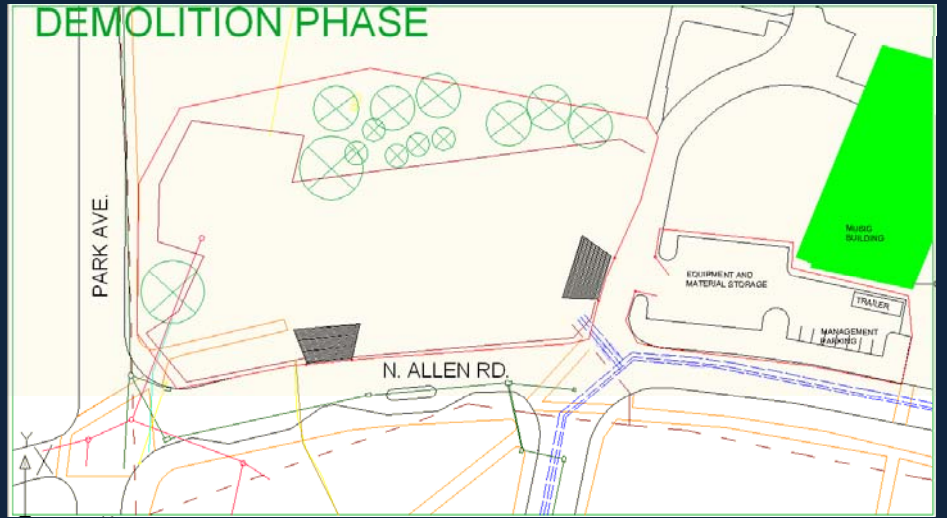
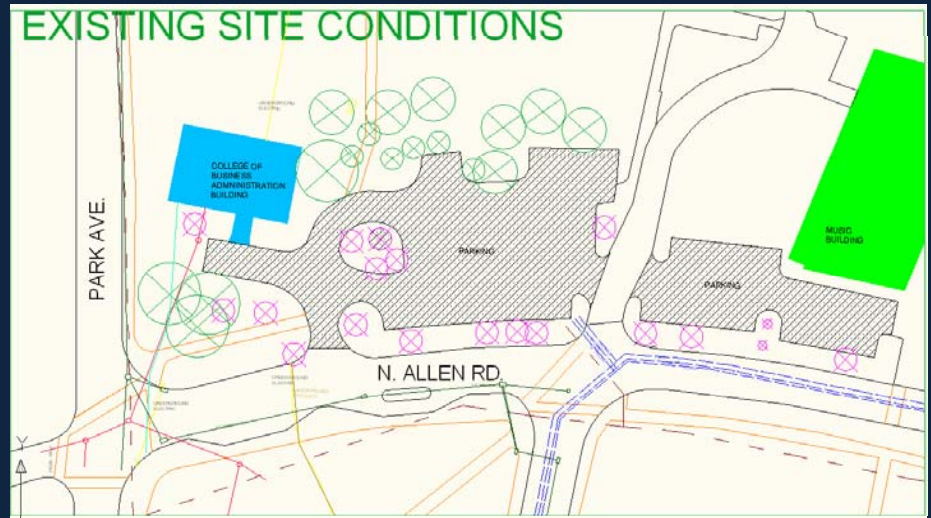
Structural Loads for calculation

Classroom L.L. = **40psf**
 Corridor- 2nd floor = **80psf**
 Superimposed D.L. = **15psf**
 Deck: 1.5VL18, SDE max clear span = 10'-6"
 Deck + Slab + radiant slab = **50psf**
 Wall load 2nd story = **20psf**
 $W_u = 1.2(75) + 1.6(40) = \mathbf{154psf}$ (class)
 Windward Wind Pressure- **12.34psf**
 Open Web Joist – 26K9
 -T.W: 5 to 6ft
 Structural Beams- W10X26, W14X30,
 Columns- 10X33 TYP

Architecture
Landscape
Architecture
Structural
Engineering
Mechanical
Engineering
Lighting-
Electrical
Engineering
Construction
Engineering

✓ CHILLED WATER	blue
COB ADM	140
CONSTRUCTION FENCE	red
Defpoints	white
EXCAVATION	232
GAS LINE	120
Keep Trees	102
Layer1	12
Music Building	green
New Building	blue
Remove Trees	magenta
Roads	250
SANITARY SEWER	240
Sidewalks	30
SILT FENCE	12
STORM WATER	96
UNDER ELECTRIC	yellow
UNDER TELE	42
WATER	14

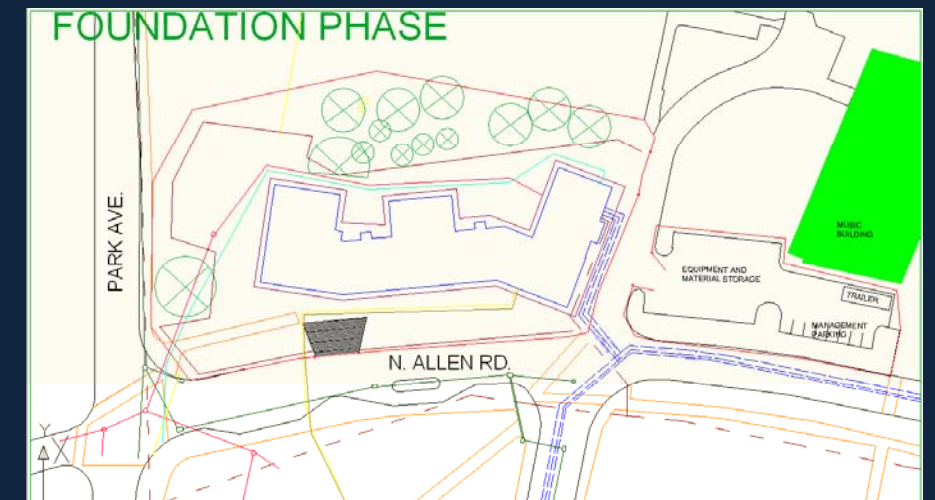
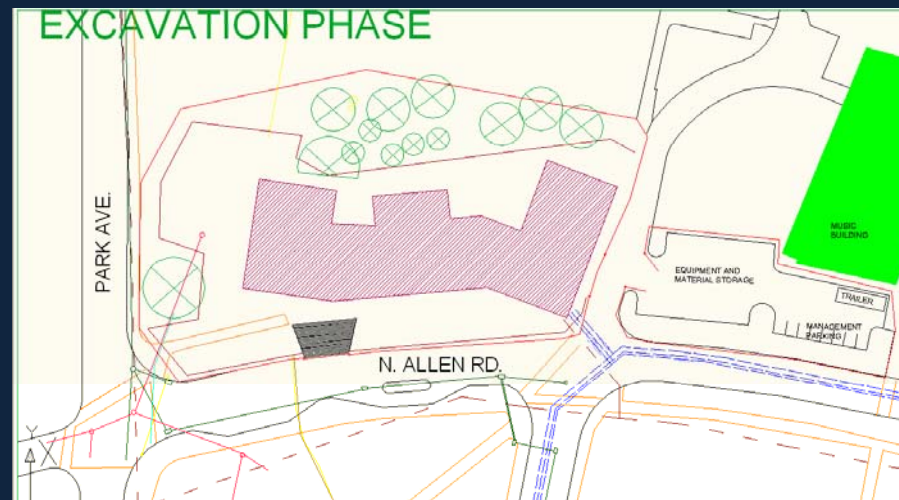
Site Logistics Studies



Architecture
Landscape
Architecture
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✓ CHILLED WATER	blue
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Site Logistics Studies



- Architecture
- Landscape Architecture
- Structural Engineering
- Mechanical Engineering
- Lighting-Electrical Engineering
- Construction Engineering

AnyLink Scheduling/Quantities

AnyLink loaded with tables from C:\Program Files\Autodesk\Revit\Autodesk Revit.rvt

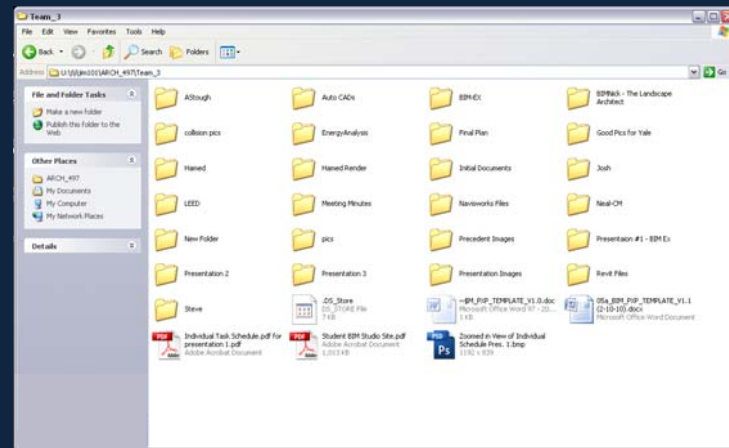
Q View Plans (All)

- Base
- Level 1
- Level 2
- Level 3
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- Level 5
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- Level 374

Detailed Structural Estimate		
	COST	DURATION (DAYS)
Forming	\$346,930.00	25
Foundation Concrete & Reinforcing	\$166,730.00	22
Columns and Beams	\$204,000.00	6.5
Joists	\$12,550.00	1
Metal Decking	\$62,232.00	6
S.O.G and Deck Topping	\$169,200.00	6
Shear Walls	\$47,650.00	2.5
TOTAL	\$1,009,292.00	69

	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1															
2															
3															
4															
5	lb/Hr	length(ft)	lbs/pc	Tons		\$/LF	Total \$		TOTAL H/shape						
6	29.34	11.15	386.11	1.54		\$75.00	\$7,896.00		185.28		Daily Output LF	Labor Hours/LF	Man Hours	Duration (Days)	
7	33	13.25	437.25	4.37		\$66.00	\$17,490.00		265		1032	0.054			
8	33	8	264	0.13		\$66.00	\$528.00		8		TOTAL LF	727.72	39.30	0.705	
9	33	14.96	493.68	3.46		\$66.00	\$13,823.04		209.44						
10	33	28	924	2.31		\$66.00	\$9,240.00		140						
11				11.81					727.72						
12															
13															
14	lb/Hr	length(ft)	lbs/pc	Tons							Daily Output LF	Labor Hours/LF	Man Hours	Duration (Days)	
15	10	26.104	261.04	0.26		\$23.50	\$1,226.89		52.208		600	0.093			
16	10	44.583	445.83	0.22		\$23.50	\$1,047.70		44.583		TOTAL LF	96.793	9.00	0.161	
17				.48					96.793						
18															
19	26	3	78	0.62		\$44.50	\$2,136.00		48		Daily Output LF	Labor Hours/LF	Man Hours	Duration (Days)	
20	26	5.385	140.01	0.42		\$44.50	\$1,437.80		37.31		600	0.093			
21	26	5.5	143	0.57		\$44.50	\$1,958.00								
22	26	5.833	151.658	0.38		\$44.50	\$1,797.84								
23	26	6	156	1.03		\$44.50	\$3,471.00								
24	26	6.5	169	2.87		\$44.50	\$9,834.50								
25	26	6.552	170.352	0.17		\$44.50	\$863.13								
26	26	6.677	173.602	0.17		\$44.50	\$594.25								
27	26	6.75	175.5	0.53		\$44.50	\$1,802.25								
28	26	7.02	182.52	0.09		\$44.50	\$312.39								
29	26	7.33	190.58	0.10		\$44.50	\$326.19								
30	26	7.66	199.16	0.10		\$44.50	\$340.87								
31	26	8.67	225.42	0.34		\$44.50	\$1,157.45								
32	26	9.54	248.04	0.25		\$44.50	\$849.06								
33	26	10.1	262.6	0.53		\$44.50	\$1,797.80								
34	26	10.51	273.26	0.27		\$44.50	\$935.39								
35	26	11.08	288.08	0.14		\$44.50	\$493.06								
36	26	11.3125	294.125	0.29		\$44.50	\$1,006.81								
37	26	11.81	307.06	0.46		\$44.50	\$1,576.64								
38	26	13.208	343.408	0.69		\$44.50	\$2,351.02								
												TOTAL DAYS		5.87	

- Architecture
- Landscape Architecture
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- Mechanical Engineering
- Lighting-Electrical Engineering
- Construction Engineering

[illegible]

Quantity Takeoffs

Revit loaded with takeoffs.rvt

Views [All]

- Floor Plans
 - Level 1
 - Base
 - Level 1
 - Level 2
 - Level 3
 - Site
- Ceiling Plans
 - Base
 - Level 1
 - Level 2
 - Level 3
- 3D Views
 - 3D View 1
 - 3D View 2
 - 3D View 3
 - 3D View 4
 - 3D View 5
 - 3D View 6
 - 3D View 7
 - 3D View 8
 - 3D View 9
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 - 3D View 308

[illegible]



Section A

-Through leafy foliage patch, stone path, groundcover garden, vegetation break (left to right)



Section B

-Through platform tower, hideaway, small mound, sand box (left to right)



Section C

-Through stone path, foliage patch, large play mound, path small mound, planting bed, large Oak Tree (left to right)

